

## ELECTROMAGNETIC INTERFERENCE AND CONTROL

### DESCRIPTION

The extension of spectrum usage, both in amplitude and frequency, as well as the greater density of usage at all frequencies, is having a major impact on the number and severity of Electromagnetic Interference (EMI) situations. The result is that the Electromagnetic Compatibility (EMC) field is growing rapidly.

The objective of this course is to provide participants with an understanding of electromagnetic interference and compatibility. The course material will be illustrated with examples of actual interference situations and their solutions. No extensive use of mathematics will be required to understand the principles and practices of electromagnetic compatibility.

### WHO SHOULD ATTEND

Engineers, managers, and others who need a better working knowledge of electromagnetic interference and compatibility, but who possess limited backgrounds in the field.

### PREREQUISITE

There is no prerequisite for this course. However, a degree in engineering or science, or equivalent experience would be helpful.

### OUTLINE

- Introduction — Definition of EMC Terms
- Review of Electromagnetic Fundamentals: Wave Impedance, Radiation Resistance, Field Strength, Antenna Gains and Patterns
- Conducted Paths: Transfer by Resistance, Inductance and Capacitance
- Radiated Paths
  - Electric and Magnetic Field Sources
  - Transmission by Wave Propagation
- Characteristics of Interference
  - Spectral Extent and Waveform
  - Amplitude Behavior

252

### SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### CONTINUING ENGINEERING EDUCATION PROGRAM

# ELECTROMAGNETIC INTERFERENCE AND CONTROL

December 3-7, 1979

May 5-9, 1980

October 13-17, 1980

ROUTE TO:



THE  
GEORGE WASHINGTON  
UNIVERSITY

WASHINGTON, D.C. 20052

(202) 676-6106

(800) 424-9773

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No. 252

### ELECTROMAGNETIC INTERFERENCE AND CONTROL

Registration form  
May 5-9, 1980  
October 13-17, 1980

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George Washington University  
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Register me for this course ☐ December 3-7, 1979  
☐ May 5-9, 1980  
☐ October 13-17, 1980

☐ Payment enclosed ☐ Pay at course ☐ Bill office

DETACH ENTIRE PANEL AND MAIL TO:  
Continuing Engineering Education, George Washington  
University, Washington, D.C. 20052

Please Return Entire Panel

078700000011 S9 0879  
T NELSON  
BOX 3  
SCHODLEY MT NJ 07870

Please Note: We occasionally mail to selected lists which cannot be cross-checked against  
If so, we hope you will pass it along to the appropriate organization.



- Bandwidth: Broad Band and Narrow Band Statistical Characteristics
- Noise: Thermal, Impulsive
- Interference Sources and their Characteristics
  - Natural Sources (Atmospherics, P-Static)
  - Commutators
  - Heater Circuits
  - Fluorescent Lamps
  - Data Processing Machines
  - Static Power Devices
  - Power Supply Outputs
  - Automotive Sources
  - ISM Equipment
  - Functional Nonlinearities
  - Electromagnetic Pulse
- Design Practice for Interference Reduction
  - Noise Source Treatment
  - Noise Transmission
  - Sensitive Devices
- Grounding
  - Single-Point
  - Multi-Point
  - Circuit Grounding
  - Power Supply Grounding
  - Relay Grounding
  - Safety Grounds
- Bonding
  - Bonding Methods
  - Surface Treatment
  - Corrosion and Alloying
- Shielding
  - Absorption and Reflection
  - Magnetic Shielding
  - Multiple Solid Shields
  - Thin Film Shielding
  - Non-Solid Shielding
  - Cable and Connector Shielding
  - Conductive Coatings
- Filtering
  - Reflective Filters
  - Lossy Filters
  - Filter-Pin Connectors
  - Transient Suppression
  - Noise Blankers, Cancellers and Limiters
  - Beads and Special Filter Types
- Equipment Design
  - Transmitters
  - Receivers
  - Digital Computers
  - Power and Control Devices

- Mathematical Models
  - Intersystem Analysis
  - Intrasystem Analysis
  - EMI Prediction
- Specifications: Military, Government, Industrial
- Measurement Methods
  - Time and Frequency Domain Measurements
  - Measurement Automation
  - Crawford Cells
  - Use of Fiber Optics
- Test Facilities
  - Shielded Enclosures
  - Anechoic Chambers and Materials
- Spectrum Management

### INSTRUCTOR

**Bernhard E. Keiser**, DScEE, is a consulting engineer in electromagnetic compatibility and related fields. He is a Registered Professional Engineer in Virginia, Maryland and the District of Columbia.

Dr. Keiser has many years of experience in electromagnetic interference and compatibility and has directed and participated in numerous EMC analysis and test programs. He is the author of *Principles of Electromagnetic Compatibility* and has written 24 published papers.

Prior to establishing his own consulting practice, he held a number of advanced engineering and management positions in several major corporations.

Dr. Keiser is Chairman of the Washington Chapter of the IEEE EMC Society and Technical Program Chairman of the International EMC Symposium to be held in Baltimore in October, 1980.

### TEXT

The text for the course is *Principles of Electromagnetic Compatibility* by Bernhard E. Keiser.

### FEE

The fee for the course starting December 3 is \$560. This includes lecture notes, text and supplies. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Participants may delay payment until arrival. Parking is provided.

### HOUSING

Hotel accommodations may be difficult to obtain and, therefore, should be made as soon as possible. If you have difficulty obtaining reservations, we will be happy to assist you.

### TIME AND PLACE

Check-in will be at 8:15 a.m. on the first day in the 6th floor lobby of the University Library, 2130 H St., N.W. (corner of 22nd and H), Washington, D.C. Classes will meet from 8:30 a.m. to 4:15 p.m.

### CONTINUING EDUCATION UNITS (CEU)

Course participants will receive a Certificate of Completion indicating the number of Continuing Education Units (CEUs) awarded for the course. The CEU is a standard measurement for noncredit continuing education programs. One CEU is given for each 10 contact hours in the classroom.

### REGISTRATION

Tentative or final registration should be made as soon as practicable. Fill out and mail the attached registration form, or apply by letter, telephone, TELEX or purchase order to Continuing Engineering Education Program, George Washington University, Washington, D.C. 20052, (202) 676-6106, the toll free number (800) 424-9773, or TELEX 64374.

### SPECIAL COURSES

Arrangements can be made to design certain courses to meet the needs of an individual activity for presentation on or off campus.

### UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of sex, race, color, religion, national origin, or handicap in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 call for an explicit statement that the requirement not to discriminate on the basis of sex or handicap extends to employment in and admission to such programs and activities. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.